Math 112
LQuiz 01

2022–01–11 (T)

Your name: _____

Instructions

Number of exercises : 12
Permitted time : 30 minutes
Permitted resources : None

Instructor's notes:

- BEFORE SOLVING any exercises, please go through the entire quiz and write a "confidence number" 1–5 to the LEFT of each exercise, denoting how confident you are that you can correctly solve the exercise (1 = "Not at all confident", 5 = "Very confident"). Then, have fun solving!
- Sections 1 and 2 review concepts you have engaged previously. Section 3 previews concepts we will engage this semester. While concepts in Section 3 may be novel to you (for now), I encourage you to try to say something insightful on these exercises, time permitting.
- AFTER you are done working with this quiz, please scan or photograph your work and upload it to the Assignments page on Canvas, titled "Quiz : 2022_01_11".

1.1	/4	2.1	/4	3.1	/4
1.2	/4	2.2	/4	3.2	/4
1.3	/4	2.3	/4	3.3	/4
1.4	/4	2.4	/4	3.4	/4
Total	/16		/16		/16

Precalculus

1.1 Exercise 1.1

(4 pt) Let

$$f(x) = \frac{3x+8}{x^2+4x+2} \qquad\qquad g(x) = x-2$$

(Assume the domain and codomain of f and g are the largest possible subsets of the real numbers, **R**, for which the above rules of assignment make sense.) Find the composition $(f \circ g)(x)$, presented as simply as possible, and state its domain (i.e. the allowed values of x).

1.2 Exercise 1.2

(4 pt) Show that the following expression simplifies to a single trigonometric function. State any disallowed values of θ.

$$(\sec\theta - \cos\theta)\csc\theta$$

1.3 Exercise 1.3

(4 pt) Solve the following equation exactly. If this is not possible, or no solution exists, state so.

$$\ln \sqrt{x+3} = 2$$

1.4 Exercise 1.4

(4 pt) Compute the following.

$$\sum_{m=1}^{19} (5m+2) - \sum_{n=-2}^{4} n^2$$

Differential calculus

2.1 Exercise 2.1

(4 pt) Let $f : \mathbf{R} \to \mathbf{R}$ be the function defined by

$$f(x) = x^3 + 3x^2 - 9x + 13$$

Find all points $(x, f(x))$ where the tangent line to the graph of f is horizontal.

2.2 Exercise 2.2

(4 pt) Compute the first derivative of the following function.

$$v(t) = t^2 \ln(2t^3) + \arctan(5t) - \sin\left(\frac{\pi}{12}\right)$$

(Assume the domain and codomain of v are the largest possible subsets of the real numbers, $\mathbf{R}$, for which the above rule of assignment make sense.)

2.3 Exercise 2.3

(4 pt) Let $f : [2, +\infty) \to \mathbf{R}$ be the function defined by

$$f(x) = \sqrt{2x - 4}$$

Using the limit definition of the derivative (!), compute $f'(x)$.

2.4 Exercise 2.4

(4 pt) Compute the following limit.

$$\lim_{x \to +\infty} \frac{3e^x + 5}{5e^x + x + 1}$$

Integral calculus

3.1 Exercise 3.1

(4 pt) Solve the following initial value problem (i.e. find f satisfying the following conditions).

$$f'(x) = x^2 + \sqrt{x} \qquad \text{such that} \qquad f(0) = 2$$

3.2 Exercise 3.2

(4 pt) Let $f : [-2, 2] \to \mathbf{R}$ be the function defined by

$$f(x) = 2 - \sqrt{4 - x^2}$$

Find the average value of f on the interval $[0, 2]$. Then find a value x_0 of x on this interval such that $f(x_0)$ equals this average value. (Is such an x_0 guaranteed to exist? Why or why not? Is it unique?)

3.3 Exercise 3.3

(4 pt) Compute the following derivative.

$$\frac{d}{dx}\int_0^{\ln x} e^{2t}\,dt$$

3.4 Exercise 3.4

(4 pt) Compute the following indefinite integral.

$$\int x^2 \sin x\,dx$$